

FLIGHT

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ENGINEER
&
AIRSHIPS

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER

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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

Feb. 15	.....	Lecture, "The Practical Aspects of the Sea-plane," by Wing-Commander Cave-Brown-Cave, before R.Ae.S.
Mar. 1	.....	Lecture, "Helicopters," by Major F. M. Green, before R.Ae.S.
Mar. 1	.....	Entries close for the Schneider Cup
Mar. 15	.....	Entries close for Dutch Height Indicator Competition.
Mar. 15	.....	Lecture, "The Control of Aeroplanes at Slow Speeds," by Professor B. Melvill Jones, before R.Ae.S.
Mar. 23	.....	Entries close for Gordon Bennett Balloon Race
Apr. 12	.....	Lecture, "Some Controversial Points in Aircraft Design," by F. T. Hill, before I.Ae.E.
May 11	.....	Lecture, "Experimental Flying," by Maj. M. E. A. Wright, before I.Ae.E.
June 25-30	.....	International Air Congress, London
June 30	.....	R.A.F. Aerial Pageant
July	.....	Air Race for King's Cup
July 20	.....	Gothenburg Exhibition
Aug. 6	.....	Aerial Derby
Aug. 6-27	.....	French Gliding Competition, near Cherbourg
Aug. 8-12	.....	F.I.A. Conference, Gothenburg.
Sept. 23	.....	Gordon Bennett Balloon Race, Belgium
Dec. 1	.....	Entries close for French Aero Engine Competition

EDITORIAL COMMENT.



IN connection with the official statement on the R.A.F. Reserve printed on p. 97, a few supplementary remarks may not be without interest. The Reserve of the R.A.F. falls into two main divisions: officers and other ranks. In the former division there are to be four main groups or categories: Classes A and AA, officers for flying duties. Classes B and BB, officers for technical duties, with a knowledge of modern aircraft. C, officers for technical, accountancy and other duties not included under B; and D, medical officers. In order to save disappointment, it is perhaps well to point out that, for the time being, there is no likelihood of the R.A.F. Reserve wanting officers under Classes C and D, these being forthcoming in the normal course from the R.A.F. itself. With regard to men the same holds good at present.

Expansion of R.A.F. Reserve

Group A will be drawn from four separate sources: (1) Permanent officers of the R.A.F. resigned or retired; (2) officers holding short-service commissions and who automatically pass in to the Reserve; (3) officers who were in the R.F.C. or R.N.A.S., and who had a period of reserve service to complete; (4) former officers who were qualified pilots in the R.F.C., R.N.A.S., or R.A.F. during the war, and who are now in civil life. It may be mentioned that the Air Ministry expects to draw upon the last class very extensively.

With regard to Group AA, candidates for this will be mainly drawn from among those who are civil pilots, but who have not previously held a commission in the air services.

Class B is open to officers returned to civil life after service with air services, as under: (e) in the official statement printed on p. 97; while Class BB will include gentlemen who possess the necessary technical qualifications for one of the branches mentioned above, but have not previously held a commission in any of the air services.

As already mentioned, at present the Air Ministry is not likely to require candidates under Classes C and D. With regard to other ranks, these will be enrolled on the colours system, and no volunteers are at present required from outside the R.A.F.

At present the Air Ministry has not laid down any definite scale of strength for the R.A.F. Reserve, but it is hoped that in two or three years' time the Reserve will consist of some 700 officers and 12,000 men. It may be stated, however, that several hundreds of officers are wanted at once, in the classes indicated above. The cost of the Reserve will naturally depend on its strength, but it is thought that with the system adopted for training and practice the cost will be quite moderate, and at any rate it is not, we understand, expected to exceed £250,000.

The period of enrolment in the R.A.F. Reserve will be three to five years, in the case of Classes A and AA; four years' initial enrolment for Class B; and a minimum of three years and a maximum of five years in Class BB.

Candidates selected for commissions in Class A will be entered in the Reserve when arrangements have been made for them to undergo a re-qualifying course in flying, unless they can prove that recent experience in flying renders such a course unnecessary. Details of this course are not yet settled, but negotiations are proceeding with a view to establish four civilian schools in various parts of the country at which candidates would undergo a course of about one month's duration, or, at any rate, not exceeding two months. All officers will be regarded as on probation until they have passed their re-qualifying course, after which they will be confirmed in their appointments.

Candidates selected for commissions in Class AA will be entered at once as Pilot officers on probation. If satisfactory, they will be confirmed in their appointments when they have completed six months in the Reserve.

We understand that the four civilian schools whose services it is hoped to enlist are the de Havilland Aircraft Co., at Stag Lane; the Bristol Aeroplane Co. at Felton; Armstrong-Siddeley's at Coventry and Beardmore's at Glasgow. The arrangements are, however, not completed yet.

Officers of Classes B and BB will be liable to undergo a technical course lasting two weeks in each year, and to pass a medium standard re-qualifying examination at the end of the course.

On the question of pay, we understand that officers of the Reserve will receive the same pay and allowances as officers of corresponding rank in the R.A.F. Subject to complying with the regulations as to training, etc., officers will be paid annual retainers which in the case of Classes A and AA have been fixed, at £30 per annum, and for Classes B and BB at £20 per annum.

These are, briefly, the lines upon which the R.A.F. Reserve is being built up, and it is gratifying to find that the Air Ministry has now taken practical steps towards ensuring the establishment of a link between the personnel of the R.A.F. and civil life. Not only so, but it is hoped and expected that a great proportion of the officers of the Reserve will be drawn from civil life. This begins to promise effect to that particular function of civil aviation which is not its least valuable asset: that of forming a Reserve to the R.A.F. much as does the Mercantile Marine in the case of the Navy.

The Air Conference

The Third Air Conference is now a thing of the past, and the question naturally arises: What has been accomplished? Personally, we feel that somehow this year's Conference was more promising than previous ones. For

one thing, the papers did not give rise to discussions that ought to have been held at the Royal Aeronautical Society. That is something in the way of improvement. For all that, we think Mr. Holt Thomas, as usual, hit the nail on the head when he said that the Air Conference was not meant to be a committee of experts, but was intended to attract business men. In other words, the real object of the Air Conference should be to afford business men an opportunity of finding out what commercial aviation can do for them. Of that, it is to be feared, little has been accomplished, and we may as well frankly admit that this is due, in no small measure, to the fact that we, the aviation community, do not ourselves know what are the possibilities of aviation. Sir Henry White Smith pleaded for facility for firms to do research work, and stated that at the moment we really do not know what is a commercial aeroplane.

Although relatively little attention was given to this subject, it is one which plays an extraordinarily important part in the future development of commercial aviation, and to us it seems that, without exception, members who spoke at the Conference failed to realise this fundamental problem. There is little doubt that with four services in operation this year much will be learned, but we are frankly afraid that the design of commercial aircraft will not benefit greatly.

Owing to the fact that the London-Paris service has been, with the exception of a few months towards the end of last year, the one upon which we concentrated, there has been no visible attempt at finding specialised aircraft. Excellent types have been evolved, but they have been handicapped by the fact that they were so designed as to be capable of accommodating any sort of load. To our way of thinking this is a mistake. It will probably be found that, in order to get maximum efficiency, machines should be specially designed for the work to be done.

Thus, it can be imagined that one type will be intended solely for mails. This type will be fast, as speed is of first importance. It will not, at first, need to be large, and it will have but one occupant—the pilot. It is fairly certain that a pilot, knowing that he has no passengers on board, will get through even in very bad weather conditions. With more encouragement from the G.P.O. the mail aeroplane would have been an accomplished fact.

The second type we have in mind is for passengers only, and will probably be a development of the present type, with increased comfort for the passengers and any safety device that tends towards greatest freedom from mishap.

The third type will be designed for goods and parcels, and designs have already been got out which promise to produce machines affording a maximum of convenience in loading and unloading. This type need not be so fast as the two previous ones, and should be capable of very great economy in carrying much greater useful loads per horse power than the mail plane, and considerably greater than the passenger carriers, in which upholstery, heating apparatus, wireless, etc., run away with such a large percentage. If due consideration is given, at next year's Air Conference, to points such as these, we think that better progress will be made. It is, perhaps, too much to hope that machines of these types may be put on the services during the present year so that the experience may be available when next we meet at the Guildhall.

THE MARCEL BESSON H5 QUADRUPLANE FLYING BOAT

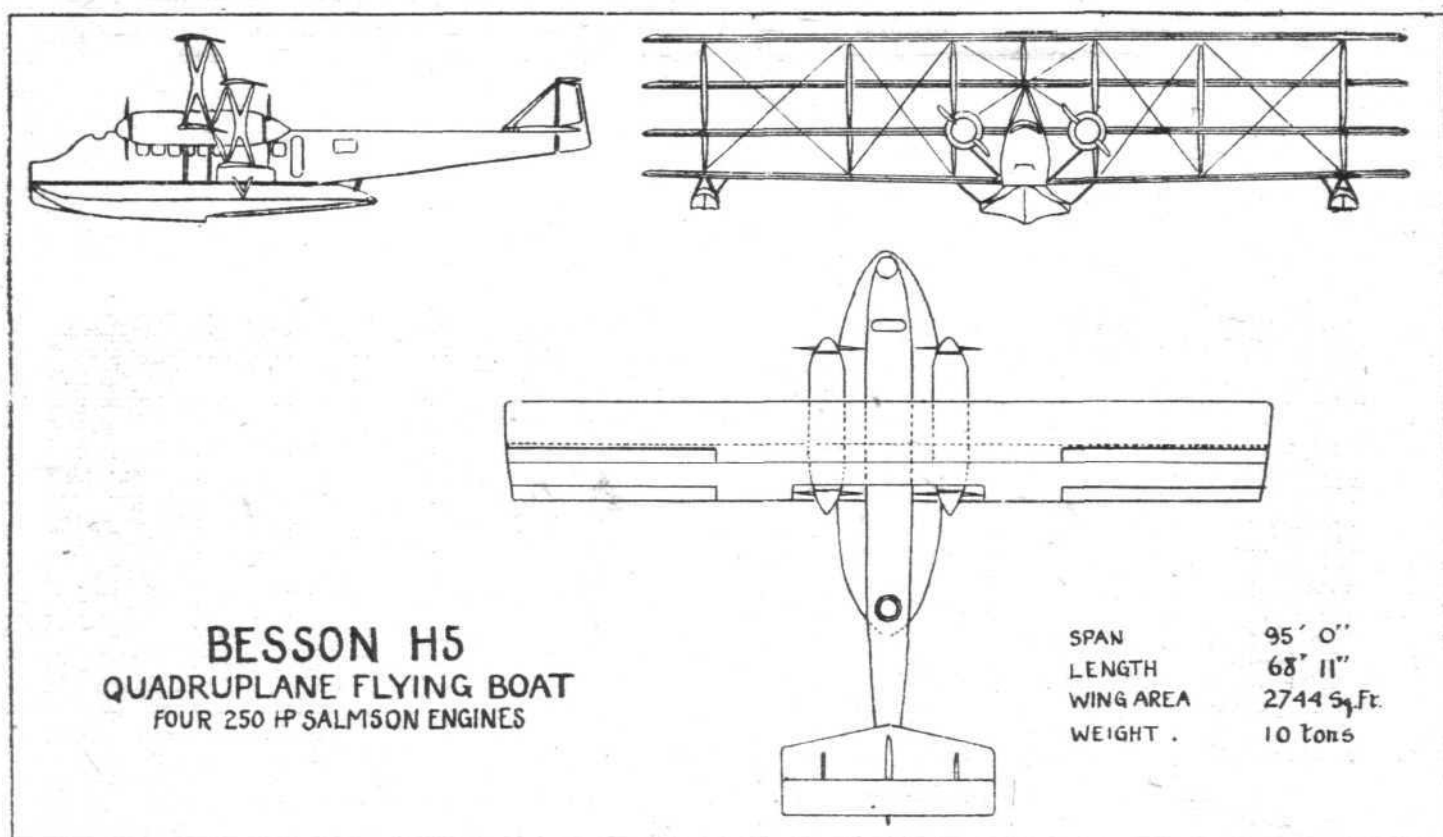
SUCCESSFUL and, it would seem, promising trials were carried out recently at St. Raphaël with a new and interesting type of flying boat evolved by the French firm of Marcel Besson, of Boulogne. In designing this machine, M. Besson was faced with the difficult problem of producing a craft capable of carrying heavy loads and a large number of passengers—this machine accommodates as many as 20—but which at the same time would not be too unwieldy for practical purposes. For the surface required—2,744 sq. ft.—the monoplane, and even the biplane, were set aside on the score of requiring too large a span, and the multiplane was considered the only practical solution. M. Besson also favoured the flying boat, inasmuch as this type is held to possess great possibilities in the future development of air transport, especially in connection with air lines round and about the Mediterranean.

Having decided on the multiplane, M. Besson arranged his planes in quadruple form, one pair close behind the other, and each pair stepped or staggered in relation to the other. This arrangement, from an aerodynamical point of view, is open to question, on account of the probable interference between the forward and rear pairs of planes. It is stated, however, that the trial flights demonstrated that there was little or no interference, and if this is the case, further pro-

travel is also small, whereas this would be much greater if only two planes, giving the same combined total area, were employed. Consequently it is said that, for a large machine, this arrangement makes for easier piloting.

The tail group of the Besson Quadruplane is also interesting. It consists of two horizontal and three vertical surfaces. Of the former the upper and smaller surface is used as an elevator only, whilst the lower and larger surface (26 ft. 3 ins. span) serves as a stabiliser, and has an auxiliary "elevator" for adjusting the incidence for longitudinal trimming. The three vertical surfaces comprise a central triangular fin, to the trailing edge of which is hinged a rudder and two similar but smaller units mounted one on each side of the central one. The hinged flaps on these outer surfaces are normally in neutral position, but may be adjusted at the will of the pilot for the purpose of trimming the machine, should the failure or fall in power of one or other of the engines necessitate this.

Another very interesting feature of the Besson H5 is the hull. This is of the combined boat and fuselage type, consisting of a comparatively short length boat, on the top of which is mounted a more or less conventional fuselage, which carries the planes, power plant, cabin, etc., as a self-contained unit. It is possible, therefore, to remove the boat, and



THE BESSON H5 QUADRUPLANE FLYING BOAT : General arrangement drawing.

gress under service conditions with this machine, which presents so many unusual features, will be watched with interest. The Besson H5 Quadruplane is admittedly an experimental machine, and it is proposed to give it a thorough trial in the near future on the Marseilles-Algiers line, for which purpose new 300 h.p. Salmson engines will replace the present old 250 h.p. engines of similar make.

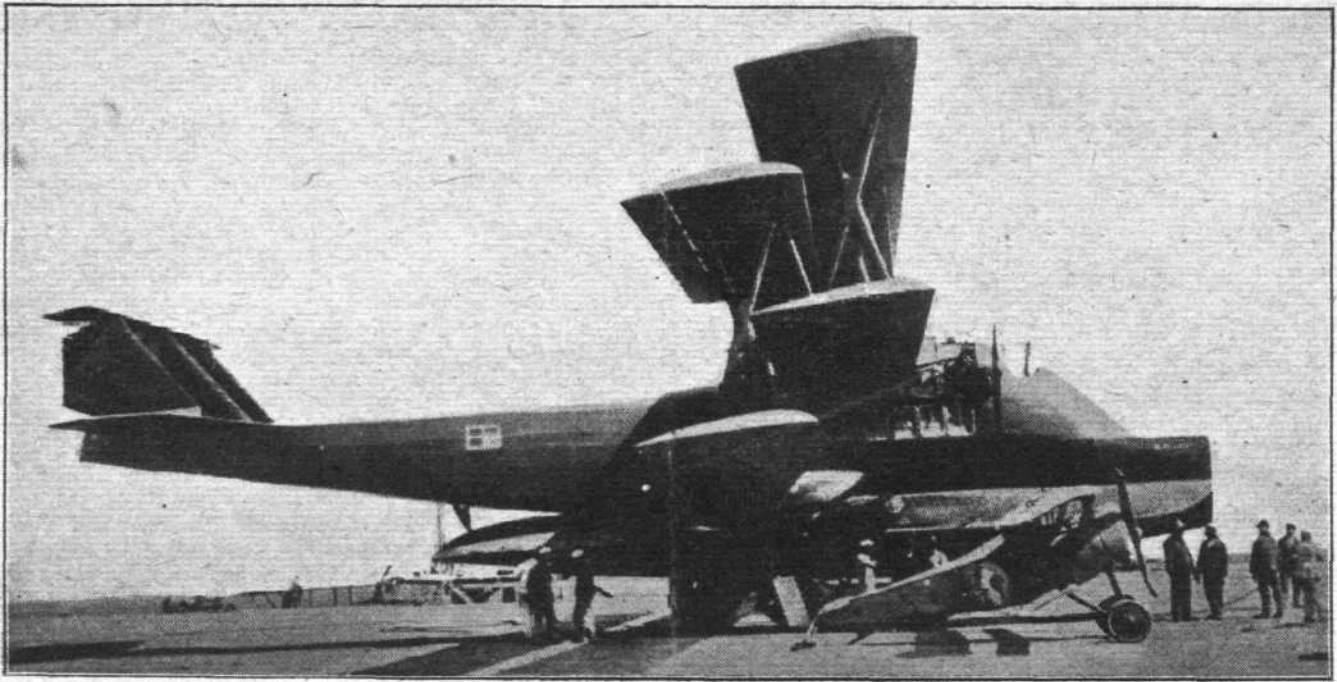
We give herewith a brief description of this machine. The main planes are of comparatively thick section, and have a high aspect ratio. The upper and third planes are located a little less than the chord width in advance of the second and bottom planes. Each pair of planes has an arrangement of X interplane struts, whilst struts also connect the rear spars of the forward planes to the front spars of the rear planes. The whole wing cellule is divided into three bays each side. The arrangement of struts has enabled the wire bracing to be reduced to a minimum. The lowermost plane is set at a dihedral angle—about $1\frac{1}{2}^\circ$. Ailerons are fitted to all four planes; these ailerons, it will be seen, are long and narrow, and although their individual effectiveness may be slight, their combined action should give ample control.

One advantage claimed for the grouping of the main planes as adopted by M. Besson is that the travel of the centre of pressure for each plane is small, and therefore the total c.p.

substitute wheel-gear, and thus convert the machine into a land 'bus. Wing-tip floats of ample proportions are fitted to the lower planes.

The boat hull is of the V-bottom single step type, 11 ft. 6 ins. beam by 46 ft. in length, and is very strongly constructed so as to withstand rough seas. It is built up of three-ply mahogany, with linen in between the layers, riveted to cross members. The whole hull is divided up into 24 watertight compartments in order to keep the machine afloat in the event of local damage to the hull. The fuselage, as previously stated, is of conventional construction, fabric covered. The pilot's cockpit, which is provided with dual control, is located high up in the forward portion of the fuselage, and immediately behind is a large and roomy cabin accommodating 20 passengers, and provided at the rear with a lavatory. Behind the cabin is the wireless operator's cockpit. In addition to the usual engine controls in the pilot's cockpit, an engine "telegraph" system, communicating with the mechanics within the cabin is also provided, so that the engines may be controlled much in the same way as on board ship.

The engines at present fitted are four 250 h.p. Salmsons, arranged two in tandem on each side of the fuselage and in line with the third (from top) plane. Each pair of engines is enclosed in a streamline nacelle, and the front engines, driving



THE BESSON H5 QUADRUPLANE FLYING BOAT : Side view, in which an idea of its proportions may be obtained by comparison with the figures and the Nieuport machine in the foreground.

tractor screws, are placed well forward; whilst the rear ones driving pusher screws, are nearly in line with the trailing edges of the rear pair of planes. Four Lamblin radiators are employed for cooling, and are mounted on the nacelle, one on each side under the third plane.

During the tests at St. Raphaël the Besson Quadruplane, which weighs, fully loaded, just over 10 tons, took off after a run of some 500 yards, and gave a speed of 81 m.p.h. with full load. The longitudinal stability was found to be good.

The principal characteristics of the Besson H5 are :—

Span	95 ft.
O.A. length	68 ft. 11 ins.
O.A. height	23 ft.
Chord	6 ft. 10 ins.

Gap (approx.)	5 ft. 6 ins.
Area of main planes	2,744 sq. ft.
Area of stabiliser	161.5 sq. ft.
Area of variable incidence	53.8 sq. ft.
Area of elevator	86 sq. ft.
Area of fins	57 sq. ft.
Area of rudder	34.4 sq. ft.
Area of aux. rudders	27 sq. ft.
Weight (full load)	10 tons
Weight/h.p.	22 lbs.
Weight/sq. ft.	8.2 lbs.
Speed	81 m.p.h.
Duration	6 hrs.
Fuel capacity (6 hrs.)	400 galls.
Oil capacity	26 galls.



Boy Scouts and Aviation

SPEAKING at a Dinner at the Authors' Club on Monday last—when Major Lord Hampton, Chief Commissioner of the Boy Scouts, was the principal guest—General Sir William S. Brancker said the Boy Scout movement was our greatest bulwark against Bolshevism, anarchy, and Communism. It sought to educate every section of the population, and it taught patriotism, the value of discipline, and of law and

order, self-reliance, independence, freedom, and right living in the individual. The Boy Scouts, he thought, might be brought into closer touch with aviation. There were aerodromes in several parts of the country, and he suggested that the Boy Scouts should be told that where such places existed the people in charge would help them in every way, would show them everything they could, and give them joy-rides. Boy Scouts and Aviation would thus help each other.



An A.D.C. Modification : This D.H.9 has been altered considerably by the Aircraft Disposal Company, and among other changes will be observed the substitution of Lamblin radiators for the usual nose radiators.

THE THIRD AIR CONFERENCE

[LAST week we published extensive extracts from the paper on seaplanes read by Mr. C. R. Fairey, and synopses of the other papers read before the Third Air Conference. This week we continue with extracts from the papers read during the morning of the first day of the Conference, i.e., "The Position of Air Transport Today," by Major-General Sir Sefton Brancker, and "The Establishment of a Self-supporting Airship Service," by Commander Dennis Burney. Next week we hope to conclude by publishing the remaining papers and a report of the discussion.—Ed.]

THE POSITION OF AIR TRANSPORT TODAY

By Major-General Sir W. Sefton Brancker, K.C.B., A.F.C., Director of Civil Aviation

THE INTERNATIONAL COMMISSION FOR AIR NAVIGATION

THE International Convention for the Regulation of Aerial Navigation was drawn up under the auspices of the Treaty of Versailles. Its object was to facilitate air transport between States who were signatories to the Convention, and to ensure the proper standard of safety and reliability throughout the air transport activities of those signatories. The Convention was signed by 21 States, but so far has only been ratified by the nine following States:—The British Empire, Belgium, Bolivia, France, Greece, Japan, Portugal, Jugoslavia and Siam. Persia has also adhered to the Convention since, and is now represented on the Commission.

The Commission first met in Paris last July, and it was there decided that it should meet three times a year at the capital of one of the signatories wherever most convenient. Its second session was held in London during October, and its next will be in Brussels at the end of February. Its meetings so far have been remarkable for the cordiality of the relations between all nations represented; there has not been a single point of serious difference of opinion, and in consequence very considerable progress has been made.

Some of the non-signatory States had several criticisms to make against the Convention as it stood, particularly with regard to two Articles, Article 5 and Article 34. Article 5 as it stood made it impossible for a contracting State to allow flight above its territory of aircraft belonging to a non-contracting State, except by means of a special and temporary authorisation. An amended wording of Article 5 was drawn up in July, and finally approved at the London meeting in October. By the new Article 5 contracting States have freedom to make agreements with non-contracting States without let or hindrance, so long as these special agreements do not infringe the rights of the contracting States, and do not clash with the rules laid down in the Convention or its Annexes.

Article 34 relates to the International Commission for Air Navigation. Under this article, the voting power of members of the Commission is such that the five great allies, France, Italy, United States, Japan and Great Britain if voting together will always have a majority. The present representative gives France, Japan and Great Britain two votes apiece. The small nations naturally take exception to this, and this Article has undoubtedly been a deterrent for the late neutral nations from asking for membership. They plead that it smacks too much of the Great War, and that they cannot agree to the principle of the old allies always being certain of a majority. This question has also been considered, and it is generally agreed that something must be done to modify Article 34.

Actually, the fact that two of the great allies—the United States and Italy—have not yet ratified makes the assured majority of the great allies inoperative. I believe that Italy and Czecho-slovakia are about to ratify and that the United States are also considering the question seriously.

It is of urgent importance for the future of air transport that all nations, including our late enemies, should sign the International Convention, as it is only by its means that common rules of navigation, lighting, signalling and other regulations for the safety of aircraft and personnel can be extended throughout the world.

The International Commission has so far been an unqualified success and personally I have very great hopes that it will develop into a strong factor towards maintaining the peace of Europe in the future.

HISTORY OF AIR TRANSPORT DURING THE PAST YEAR

Subsidised Services.—The new subsidy scheme which had just been decided at the time of our meeting last year catered for three rival companies flying to Paris and one company to Brussels. The Daimler Airways Co. had risen from the ashes of the old Aircraft Transport and Travel Co., and had been approved by the Air Ministry for the Paris route as

well as Instone and Handley Page. The Instone Air Line had also been allotted the Brussels route in addition to Paris. On paper this scheme looked wonderful. In practice it did not work satisfactorily. It had three outstanding defects:—(1) It fostered undesirable competition between British firms; (2) It depended entirely on the volume of traffic obtained, and was based on a too optimistic estimate of this traffic; (3) It was too complicated in its application.

By the beginning of May, it was obvious that the scheme was not working well. All three operating companies were losing heavily and could see no hopes of any tangible improvement in the future. About the end of May it was decided by the Air Council that something must be done at once. A scheme of compensation for past losses was first arranged. These losses were the direct result of deficiency in the passenger and goods traffic; so the amount of compensation was calculated on the number of passengers anticipated when the subsidy was drawn up. The increase hoped for was reckoned at 65 per cent. on the traffic of 1921, of which it had been contemplated that 75 per cent. would have been carried by British aircraft.

On this basis, for each passenger less than this number, a grant of £10 17s. 6d. was allowed as representing the amount that could have been received in fare and Government subsidy. This gave us the lump sum which should have been expended on firms if traffic had come up to expectations. This lump sum was divided into two—one-half was divided between the firms in proportion to the number of passengers they had actually carried, and the other half in proportion to the seats they had had available. This sounds rather complicated, but I think it was just, and that it met the situation.

This scheme of payment was made to apply up to September 30, during which time a new scheme had to be drawn up and approved by the Treasury.

Even this new scheme was perforce of a temporary nature, as the money available would only last for about another 18 months. At the end of that period, that is, somewhere about the beginning of 1924, most of the £600,000 allocated for the subsidies would have been expended; so the new scheme was only intended to remain in force for the period during which some more far-reaching line of Government policy regarding air transport must be evolved.

This temporary scheme was based on the following desiderata:—(1) To preserve the three existing air transport companies, but to prevent them competing amongst themselves; (2) To extend British transport activities as far into Europe as possible with the money available, and to establish at least one internal air route in Great Britain.

After considerable discussion, arbitrary figures were laid down as representing sums just sufficient to cover the probable losses in one year on these four routes—£15,000 for Paris, £25,000 for Cologne, £55,000 for Manchester and Berlin, and £10,000 for Cherbourg and the Channel Islands. No more money was available of the unexpended portion of the £600,000 allowed for the current year.

It was also necessary to make some new arrangements regarding the supply of equipment; so the aircraft and engines which we allowed to the companies on the hire purchase system were given to them outright up to a certain limit in capital value, each company receiving approximately £30,000 worth of equipment. This cleared away all our troubles regarding responsibility for failures in material and placed the operating firms in direct communication with the manufacturers and designers. An offer was also made to furnish capital up to 30 per cent. of the value of any new equipment required by operating companies during the next financial year. I would like to add here that throughout these negotiations the Treasury were extraordinarily sympathetic, helpful and quick in arriving at a decision on general principles and by their assistance enabled us to bring the new competitive system into force on October 1.

This scheme entailed certain difficulties in that it contemplated flying into Germany. These difficulties can be put into two classes:—(1) Those involved by flying from Holland

to Berlin over the ordinary German frontier; (2) Those involved in flying over the occupied area to Cologne.

As Germany is not yet a signatory of the I.C.A.N., by Article 5, as it stands, we cannot make an agreement with her, but, as I have explained above, the International Commission has already decided to modify Article 5, so as to permit agreements with non-signatory States. As soon as ratification of this modification is concluded, we shall have power to make an agreement with Germany permitting us to fly to Berlin and German aircraft to fly to London.

The case of Cologne is more difficult. The Treaty of Versailles and the ordinances and decisions which have been drawn up since its signature forbid German aircraft to work over the occupied area until Germany has joined the International Convention. Germany was invited by the Allied Council of Ambassadors to join the International Convention during the latter part of December. Germany accepted this invitation on conditions that Articles 5 and 34 should be modified in certain respects. I think we can say that Germany is certain to become a member of the I.C.A.N. during the next few months if the Ruhr troubles do not dislocate all international arrangements.

I must mention one other difficulty which lies in our path. Germany, Austria, Hungary and Bulgaria have all accepted certain restrictions on their aeronautical design and organisation under the Treaty of Versailles. These restrictions are known as the "Nine Rules." Amongst other items, these Nine Rules impose certain limitations in speed, climb and useful load, which make it impossible for these countries to employ really efficient commercial aircraft, although, of course, they are only intended to prevent the construction of military aircraft. Germany claims that if these rules are enforced on her, she equally can enforce them against foreign aircraft crossing her frontier. If these Nine Rules are enforced, if Germany's threat holds good, and if her old Allies follow her lead, air transport to the East will be very seriously handicapped, as the only route open to our aircraft which does not impose the Nine Rules will then be via Italy and Greece. I believe, however, that the Germans are putting forward some suggested modifications to these rules, which it may be hoped will remove this direct handicap on international air transport.

From October, 1921, to October, 1922, 621,725 miles were flown. From October 1, 1922, to October, 1923, 637,846 miles is the *minimum demanded*, and probably considerably more will be flown. 1,350 miles of air routes are to be covered instead of 420 miles, and this may be raised to 1,500 or 1,600 miles, but a good deal depends on our negotiations with Germany.

Unsubsidised Undertakings.—There are two organisations which deserve special mention—the De Havilland taxi service and the Savage Sky-writing Co. Neither are helped in any way by the Government, and both have done a lot of work and made both ends meet financially.

The De Havilland Service have flown the length and breadth of Europe without a single accident to pilot or passenger. During 1922, they have flown 126,000 miles in 1,400 hrs.

Thirty-seven per cent. of this had been newspaper and cinema work, 33 per cent. taxi work, 18 per cent. aerial photography and 12 per cent. teaching. The charge made for a 250 h.p. machine carrying 3 passengers is 2s. 6d. per mile, and this, I believe, is to be reduced to 2s., which, I think you will agree, proves that air transport is already beginning to compare quite favourably with road transport.

The Savage Sky-writing Co., has been working in various parts of England and France, and has now sent an expedition to America. It is equipped with the old Fighting Scout S.E.5. The nature of the work demands very fine piloting at high altitudes, and should provide excellent training for fighting in the air. The company now have 12 S.E.5a's in commission and besides employing 16 pilots, they are giving casual employment to others. I think I can say that both these companies are national assets, and their management deserves great credit for the good work they have done.

Various small joy-riding organisations are still in existence, notably the Surrey Flying Services and the Berkshire Aviation Co. The flying hours accomplished by these enterprises are considerably less than they were in the years immediately after the War, 22,000 as compared with 36,000 and 37,000 in 1920 and 1921. This branch of civil aviation is very valuable as a means of propaganda to the public, and also provides a certain number of training machines and good training pilots and mechanics who would be available in case of mobilisation.

The King's Cup Race.—Owing to the general slump in the manufacturing industry it has been extremely difficult to keep air racing on its feet. His Majesty the King, however,

has given us a great incentive by presenting the King's Cup to be competed for annually; the first race for this Cup took the form of a handicap round England and Scotland, and was flown during September last.

This race was an unqualified success. There were 21 starters, and not one single accident. It had very great value as a means of propaganda to the public, and huge crowds gathered at all the big centres at which halts were made. I am glad to say that His Majesty the King is giving another Cup this year for the same purpose.

Perhaps the best sporting feat accomplished by British aircraft during 1922 was the winning of the Schneider Cup by the Supermarine Co., with one of their flying boats fitted with a Napier "Lion" engine. It is obvious that the promotion of racing is of distinct national value; it encourages the designer to unceasing efforts towards increasing speed, a quality which is invaluable in the fighting machine.

I may mention here another class of enterprise for which, like those I have just been enumerating, the Government can claim no credit whatever. I refer to the individual efforts and great flying feats by British pilots, British mechanics and British aircraft. We were the first nation to fly as far as Australia and South Africa; we were the first nation to fly across the Atlantic; and today we are certainly going to try to be the first nation to fly round the world. Today we have no less than five different groups of pilots who are thinking out schemes for this magnificent effort. If it is not done this year, I think it ought to be done next. In any case, the Air Ministry are all out to help in every way possible, any expedition which can prove that it is soundly organised, that proper arrangements have been made in the different parts of the world over which it will be necessary to fly, and that it has a sound financial backing.

General résumé of British Progress in Europe.—Safety and reliability are the two most important objectives which air transport has to attain today. When we have established those two factors we shall have no more trouble in obtaining traffic.

There have been *no fatal accidents to passengers* on regular British air routes during 1922; only one passenger was slightly injured in a collision on the ground; beyond this there were six minor accidents in none of which anyone was hurt. No paying passengers were either killed or injured on joy-rides. During the year the regular subsidised services carried about 10,100 passengers and 22,200 flew on joy-riding flights. I think we can fairly say that the results of 1922 point to air transport being a safe means of progress if properly organised and properly administered.

Reliability is more difficult to assess, but I can give you one set of figures which point to progress. During 1920, 1,869 flights were commenced by British machines on the London-Paris route, 80 per cent. of these were completed within 4 hrs.; during 1921, 1,926 flights were commenced, and 89 per cent. of them were completed within 4 hrs.; in 1922, 2,055 flights were commenced, and 92 per cent. of them were completed within 4 hrs. It must be remembered that these flights covered all the worst part of the winter, and that the percentage of reliability during the summer months was very much higher.

[This method of stating the reliability of air services is apt to be somewhat misleading. It is sound in so far as it should tend to assure potential passengers that, if they start at all, they will have 92 per cent. chances of getting through within the time limit of 4 hrs. On the other hand, looked upon from a purely commercial point of view, the figures mean absolutely nothing, since it would be possible for a firm, by refusing to start unless the weather were ideal, to obtain 100 per cent. efficiency. To us it appears that a sounder basis to use would be number of flights completed out of a total number of flights *scheduled*. That the figures obtained on this basis would be considerably lower may be admitted, but they would be a great deal more convincing.—ED.]

Engine failure is rapidly vanishing. During September, October and November, in 1,414 flights there were only 4 cases on the subsidised routes across the Channel.

The next point of interest is our progress towards economical running. In 1921, the maximum number of British aircraft employed on the cross-Channel services was 13 during August; and each of these 13 machines did 12 cross-Channel flights during that month. In 1922, during the same month of August, 24 machines were being operated, but they carried out double the number of flights, each *averaging 25 flights per month*.

One machine—a D.H.34, EBBS—operated by Daimler Airways, flew on 127 days out of 165, covering a total of 80,000 miles. That aircraft is still running and completed about 108,000 miles in the 9 months since April 13, without

overhaul, which works out to about 135,000 miles or 1,500 hrs. a year. This aircraft has not been fully worked and I believe we can get 2,000 hrs. a year from one machine with good organisation and heavy traffic.

We are also progressing in the amount of flying done by pilots. In 1921, it was generally considered that a pilot could not be expected to fly more than about 400 hrs. in the year. On the experience of 1922, I am inclined to think that a pilot can fly 600 hrs. in the year quite easily. In July last one firm's pilots averaged 62 hrs. flying each, and 8 pilots who have been flying regularly during the 6 months—June to November—averaged 48 hrs. a month, each without any ill-effect. This is another distinct step towards economy.

The increase of traffic carried on the London-Paris route, which is the only route of which we have statistics for more than one year, is disappointing. In 1920, 6,383 passengers crossed the Channel, and in 1921, 10,731. During 1921, in certain quarters including Government circles, a profound optimism regarding the increase of traffic prevailed, and, generally speaking, the subsidies for 1922 were based on the expectation that there would be at least 20,000 passengers carried across the Channel during that year. Actually, only 12,365 crossed the Channel during 1922. The reasons for this, I think, are threefold: (1) the two unfortunate accidents I mentioned earlier took place just as the services were getting into their swing for the summer; (2) the weather in the earlier part of the year was exceptionally bad; and (3) there had been a general financial depression in America and Great Britain.

The nationality of these passengers is interesting. Out of the total 12,000 odd, 6,600 were aliens and 5,500 were British, and most of the aliens were American. During 1921, British aircraft carried only 49 per cent. of these passengers; during 1922 we carried 76 per cent.

A satisfactory feature of the traffic is the increase in the carriage of mails, newspapers, parcels and excess luggage. During 1922, 208.6 tons were carried, which gives an average of 19 tons a month. During 1921, only 19.4 tons were carried during the whole year. A considerable proportion of this extra weight was newspapers, for which a regular service was run from Lympe to Ostend for some months during the summer.

During the spring of 1922 the wireless telephone was brought into use for the first time in air transport. At first, this invention was looked upon askance by the pilots and its reliability was much criticised, but the pilots have now learned its value and object to flying without it, and from the moment this change of mind took place matters improved and the reliability of the wireless apparatus has steadily increased.

General Progress of Air Transport outside the British Empire.—I must now give you a few brief details regarding the progress of air transport in other parts of the world. France, of course, is leading the way. Her Government from the moment the War ended was inspired with the enormous possibilities of air transport, both as a military reserve and as a means of extending political influence in the countries through which it flies. During 1922 they had 13 air routes in operation as against 8 in 1921, covering a total length of 5,300 miles as against 3,430 in 1921, and were scheduled to fly about 2,226,000 miles in the year. The most important of these is that running from Toulouse to Casablanca. It is a daily service, accomplishing the journey in 26 hrs. and covering a distance of 1,153 miles. This service is run very regularly and is now carrying about 190,000 letters a month. The French are anxious to start a line through Marseilles, Italy and Greece to Alexandretta, and a group of French business men and financiers are definitely considering the organisation of such a route in the hopes that we will organise a route from Alexandretta to Baghdad and on to India, so as to get a through line to India.

The proposed French vote for civil aviation for 1923 totals 155,750,000 francs; this includes the technical department which serves the military side of aviation as well as the civil. About 47,750,000 francs are devoted to direct subsidies; it is difficult to gauge the exact value of this sum in sterling, but I should put it at almost £1,000,000 when the local buying power of the franc is considered.

Germany also, in spite of her disadvantageous conditions, carried out a lot of flying during the summer of 1922. It is German policy to shut down all lines during the winter because they have so little equipment that they cannot carry out extensive air services throughout the year. During the summer of 1922 the Germans were operating 15 air routes as against 7 in 1921, covering a length of about 3,980 miles, as against 1,695 in 1921, and her aircraft were scheduled to fly about 1,030,000 miles as against 615,000.

In America there is a great deal of private joy-riding going on, but there is no Federal legislation and no controlling authority for civil aviation. It is therefore impossible to gauge what sort of progress is being made. There is, however, a very interesting air service being run by the Post Office. It is operating regularly every day between New York and San Francisco, the journey taking approximately 56 hrs. The service has so far been run over a section by air by day, and then by night by train and then another section by air on the following day, but it is now intended to fly right through, and one section of the route between Chicago and Cheyenne is being organised for a night service. During 1922 a total of 175,000,000 miles were flown on this route, and about 49,000,000 pieces of mail were carried. Letters go by air service as a matter of course and the public are not charged anything extra.

The Dutch are running a very efficient service between Amsterdam and London. It is supported by Government. They are using Fokker monoplanes with British Siddeley-Puma engines and the standard of their regularity and safety in running and general efficiency is very high; I have always maintained that the Dutchman is going to make one of the best air pilots in the world, just as he was one of the finest sailors in the old days, and I think this initial service bears me out.

In Belgium a new company has been formed, in which the Government will have considerable interests, for the operation of air transport in Europe. It is not clear when this company will start operations. In the Belgian Congo seaplanes have been operating (with considerable success) following the Congo River from Leopoldville to Stanleyville, a distance of 1,077 miles.

Practically every other country in Europe is convinced of the importance of air transport, and is doing its best to develop it with the funds at its disposal. The Czechs are already negotiating for an agreement with ourselves, by which a combined British and Czech company will run over a certain section in Central Europe. The Spanish are just about to bring to a conclusion the preliminary negotiations for a big rigid airship service between Seville and the Argentine. They have already for some time been running an aeroplane service between Seville and El Arish in Morocco. This service up-to-date has been equipped with British machines (de Havillands) and been manned by British pilots, and it has been remarkable for its regularity and efficiency.

Air Transport in our Overseas Dominions.—Our overseas Dominions all realise the great potentialities of air transport. Australia leads the way. She has organised two long air-routes, one from Geraldton to Derby—1,200 miles—and another from Charleville to Cloncurry—580 miles. The Geraldton-Derby service runs weekly with Bristol Tourers, which carry only two passengers; the operating company proposes to get larger machines as soon as they can. During the first 9 months of their operations they attained to 97 per cent. efficiency; during the last four, 100 per cent. No accidents have occurred and the time saved over other methods of travel is 9 days. Letters are carried for a 3d. surcharge, and have averaged a little over 1,100 a trip. The annual Government subsidy to this service is £25,000. The company has issued a dividend of 10 per cent. and has laid by more profits as a reserve.

Two more routes are being organised—Adelaide to Sydney, about 1,050 miles, and Sydney to Brisbane, about 500 miles, at a total cost of £29,000 more.

The grant for civil aviation during 1922 was £159,500, including £88,000 for direct subsidies and £56,000 on aerodromes.

There are 20 Government aerodromes and 33 Government emergency landing places, and 10 private aerodromes in Australia—and at present there are 42 licensed pilots and 78 ground engineers. They only want up-to-date aircraft to make air transport a great success without much financial assistance. Australia is an example of the advantages to air transport of bad communications and a good climate.

In New Zealand a subsidy has been given to three companies on the basis of payment for pilots, aircraft, aerodromes, etc. In the year ending March, 1922, 69,000 miles were flown and about 9,400 passengers carried.

In Canada private enterprise has done very little, but the Government have accomplished a great deal of most useful forest survey and fire patrol work, whereby a vast amount of time and a great deal of money has been saved.

In South Africa and India practically nothing has been done because there has been no money to spend.

In Newfoundland efforts have been made towards survey and reconnaissance for seals, but not much has been accomplished so far. There is a scheme afoot now for a service up

to Labrador which would save weeks of time and should prove a great success if gold is really found in Labrador in any quantities.

Here I must just mention the Cairo-Baghdad service which is being run, as you know, by the Royal Air Force. During 1922 it completed one year's operations. It flew a fortnightly service between Cairo and Baghdad, scheduled for two days, but actually, during bad weather, taking three or four days. No serious accidents have taken place during these operations.

The number of letters carried has steadily increased from a little over 10,000 during the first quarter up to 50,000 in the last quarter. This does not sound much, but it must be remembered that the total bulk of mail is very small, and that actually 28 per cent. of the inward mail and 19 per cent. of the outward mail has been carried by air. During the first quarter an average of 14 days was saved on each trip over the ordinary methods of communications; during the fourth quarter, this average saving was increased to 18 days, and at one time it has risen as high as 19 days.

Airships.—The Government offer of May, 1921, lapsed some time ago, but the material has been preserved in case the Burney Scheme came into operation. The airships which still exist are R.36—a service airship converted for commercial work. She is fitted with comfortable cabins and carries 50 passengers, with a fuel endurance of about 50 hrs. R.33 built for war purposes, and a sister ship to R.34 which flew across the Atlantic; R.80 a small ship which would be useful for training purposes—the American crew of the ill-fated R.38 was trained in her. L.71 a 1918 Zeppelin with great speed and climb, but probably too lightly constructed for commercial work; R.37 a sister ship to R.36, which is about 90 per cent. completed. These ships are all stored at Cardington and Fulham. In addition, there is a considerable quantity of airship stores of all descriptions, including engines, at these two stations.

The only tangible offer before the Government at the present time is that of Commander Burney, who wishes to form a company with a capital of £4,500,000 with a view to organising a bi-weekly service to India with a weekly extension to Australia. This scheme involves the construction of nine airships of the very latest German design. New sheds would be required at home, in India, and in Australia, for the overhaul of these ships, whilst mooring masts would have to be provided in England, Egypt, India, Rangoon, Singapore, and Australia. The Burney scheme is still under consideration, and I am not at liberty to give you any further information regarding its exact position today.

Its adoption would commit the Government to financial assistance in the shape of guaranteed interest, up to a limit of £225,000 a year tax free for ten years, and would also involve Government in a liability for this large capital in case of failure. As I have indicated already, the Civil Aviation Advisory Board have been considering very carefully the proposal to start an aeroplane service to India.

An aeroplane service involves crossing over and landing in European countries and two very unstable Asiatic countries—Turkey and Persia. On the other hand, the airship scheme has the very great advantage that no international negotiations would be necessary. By the International Convention, airships can fly over all the countries on the route and no landing organisation need be created, except in Egypt, where arrangements could easily be made.

Foreign powers generally are doing more than we are with airships. America has a large Zeppelin under construction at Lake Hurst, and another being built by the Zeppelin Co., at Friedrichshaven; both these ships are about 2,500,000 cub. ft. capacity, and are, I believe, intended for a transatlantic service and are of the very latest type.

France has two Zeppelins taken over from the Germans but, owing to lack of money, is making practically no use of them. She is, however, constructing some very large sheds just outside Paris and near Marseilles. The Paris sheds are two in number, and are 984 ft. long, big enough to house a 5,000,000 cub. ft. ship.

Germany is not allowed to build any ship above 10,000 cub. metres under the Treaty of Versailles. She is, however, keeping her technical staff employed on the ship which is being built for America, and has been endeavouring to get orders in Spain, Portugal and elsewhere.

Spain, as I have already indicated, is seriously contemplating a combined Spanish-Argentine service running from Seville to Buenos Aires. Italy is doing practically nothing. Beyond this there are no airship activities.

The Civil Aviation Advisory Board.—The Board has done much good work; it has held 12 meetings of the full Board, 11 meetings of the Technical Committee and 4 of the Finance

Committee. Last October, it issued a report on an air route to the East as far as India* with certain recommendations; and another report on the question of a suitable air port for London is at present in preparation. The change of Government has prevented the first report from being fully considered up to date. It has been referred to the various Departments of State concerned—the Post Office, Colonial Office, India Office—and as soon as the Government has framed a definite policy for the future it will be considered.

I will now just mention some salient points which have become clear in my mind as a result of their investigations.

First, regarding the Indian route. Three facts seem to me to have been established; that at least a daily service must be operated; that comparatively small aircraft should be used; and that night flying should be introduced.

Unless a daily service is flown, the overhead charges are overwhelming and cannot be justified; in addition, the minimum personnel which will be required along the route will not be getting nearly enough work. It is also obvious that the benefit accruing from the daily service to India taking 6 days are infinitely greater than those from a weekly service. It is the possibility of running a daily service that gives the heavier-than-air route to India a very distinct advantage over the lighter-than-air. A daily service for airships would entail a very large capital expenditure, and it would be difficult to find a sufficient load to justify it.

By comparatively small aircraft, I mean single engine aircraft capable of carrying somewhere about 2,000 lbs. It is impossible to count on a greater daily demand than 2,000 lbs., in the earlier stages of the service, and it would always be easy to add another small unit.

The necessity of introducing night flying as soon as possible is, of course, obvious. In my calculation of 6 days from London to Delhi, I allow for flying at 100 m.p.h. for the daylight hours only. When night flying is possible this period of 6 days will be at once reduced to about 72 hrs.

I must now turn to the second report of the Civil Aviation Advisory Board. The result of their investigations into the problem of finding a suitable air port for London. Various sites and possibilities have been considered. I think it was I myself who suggested that last year the question of building an aerodrome on the top of one of our great London railway termini should be looked into. This has been done, and it is quite possible to build such an aerodrome; but the cost would be enormous—it has been worked out roughly and it would probably be at least £4,000,000.

Croydon is inconveniently far out, and it takes at least 45 mins. to reach it in a car in ordinary traffic. Regarding the time factor, personally, I feel very strongly that air transport is the proper means of travelling over long distances and not for short ones, and, if you are going to travel a long distance, a quarter of an hour's difference in the length of the drive down to the aerodrome really does not matter. I think there is no doubt that Croydon is the best, and will be the best aerodrome in London, and that we ought to devote our energies to improving our communications with Croydon.

Relation between Civil and Military Aviation.—Now I come to a very important item—the relation between military and civil aviation. As I have tried to indicate before, they are not rivals. This last year we have made very distinct progress towards a state of absolute co-operation. The Air Staff have agreed to a scheme of training reserve pilots at civilian flying schools, and are collaborating in another scheme, where it is hoped that a definite annual bonus will be given by the Royal Air Force for the upkeep of engines of certain approved types in civil organisations.

As a start, four civilian schools at the works of four of our leading aircraft manufacturers are to be organised in different parts of England and Scotland, and arrangements are being made whereby war pilots can be given from 15 to 25 hrs. in the air to get them back to flying condition. After that those that qualify for the Reserve, and short service officers from the R.A.F. who join the Reserve, will receive periodic training—either during one period in the year, or over a long week-end every quarter.

The other proposal to grant a bonus for approved engines, is still in its infancy, but it offers such obvious advantages from the financial point of view that there is little doubt that it will reach fruition during this year.

Another slight step in advance that we have made is to institute a system of calling for tenders for experimental air transport machines on exactly the same lines as are followed in the case of military machines. Specifications for three different types are being drawn up, and will shortly be issued to all designers.

* Extracts from this report published in *FLIGHT* of August 17, 1922.

THE ESTABLISHMENT OF A SELF-SUPPORTING AIRSHIP SERVICE

By Commander C. DENNIS BURNEY, C.M.G., M.P.

The establishment of a self-supporting Airship Service necessitates the overcoming of many difficulties of a financial, political and technical character, and, perhaps, the least of these difficulties are those which are technical. Consequently, any analysis of the problem requires the investigation of all three factors. Technical questions are generally more interesting to the majority, but I feel that the cause of aviation will be better assisted in making some suggestions as to how the financial and political difficulties can be overcome; since, until a solution is found to those problems, no progress of any kind can be made on the technical side.

The benefits that would accrue from the successful establishment of an Imperial Airship Service may be divided into three groups:—

1. The imperial and political advantages accruing from a safe and cheap form of transport that would provide for the British Empire the equivalent of the through trunk railways of America, in-so-far as mails and passengers are concerned.

2. The value in war-time of a fleet of airships together with their fuelling bases all over the world.

3. The value of a commercial company with British capital operating a service on a profit-making basis.

Prospects of Commercial Success.—I will first briefly describe what has been done in regard to commercial work; then I shall indicate the recent technical developments which allow of a considerably more optimistic estimate being made of the revenue-earning capacity of a commercial company.

When airships were in their early stages, even as long ago as 1910, a German airship company called "Delag" commenced passenger work with a result that some 26,900 passengers made journeys. After the armistice (in September, 1919) this same company, with a ship named the "Bodensee," (speed, 81 m.p.h.) recommenced the passenger service between Berlin, Munich and Friedrichshaven. In three months this vessel made 103 flights, covered a distance of 50,000 kms. and carried 2,380 passengers and about 30 tons of freight. These statistics seem to indicate the suitability of an airship for passenger work, and this indication is reinforced when one remembers that there is no record of a fatal accident to any passenger carried by a commercial airship.

There are, however, several outstanding defects which have hitherto prevented the airship developing rapidly as a passenger vehicle, and they may be tabulated in the following order:—

(a) There was no method of anchoring or mooring the vessel for the purpose of embarking or disembarking passengers and freight.

(b) The carrying capacity was too small in relation to the capital cost of the vessel.

(c) The radius of action was too small for the great ocean routes.

The developments which took place both during and since the War have, in a very large measure, overcome these defects.

In considering the second clause, the disposable lift is that proportion of the total displacement of the ship which can be utilised for the support of fuel, passengers, crew, etc. Such lift can be improved in two ways; firstly, by greater efficiency of design, and, secondly, by an increase of size in the vessel built.

The improvement possible on these lines is very strikingly shown by comparing L.1, L.33 and L.71.

Vessel.	Built.	Percentage disposable lift.	Speed. m.p.h.
L.1	1912	31.6	48
L.33	1916	47.0	64
L.71	1918	67.5	73

The third clause is to a great extent governed by the disposable lift factor. Another consideration of almost equal importance is that of engine efficiency and fuel consumption, and in this connection experiments recently carried out have established that kerosene and hydrogen can be used together as an airship fuel, and the radius of action of a vessel has been increased by 33 per cent., and, furthermore, owing to the high thermal efficiency obtainable with this fuel, the exhaust temperatures are so reduced that the life of an engine should be increased by 400 per cent. The thermal efficiency is really remarkable, and the reduction takes place in two ways, the fuel is under half the cost of petrol, and the amount required is one third less.

I think the best way to show that these various improvements render a vessel efficient for the great ocean routes will be to give the capabilities of the new 5,000,000 cub. ft.

vessels which it is proposed to build. Such vessel would be approximately 760 ft. in length and 110 ft. in diameter at its maximum girth. Allowing a disposable lift of only 50 per cent., so as to make adequate provision for the increased ruggedness of construction desirable for commercial work, and assuming a flight of 3,000 miles as the average length of a commercial flight without refuelling, it would, allowing for contrary winds, give 44.5 tons for the carriage of mails, passengers, etc., at a speed of 80 m.p.h. If 375 lbs. is allowed for each passenger, the capacity of the ship will be 207 passengers and 10 tons of mail and other freight.

Estimates have been carefully worked out for a fleet of airships of this type operating on the Indian and Australian routes. The result is as follows:—

The total capital required would be £4,000,000. The capital expenditure on bi-weekly stage to India for six ships, one shed (Egypt), 6 mooring masts, 2 gas plants and alterations and additions (sheds, masts, etc.) at Cardington and Pulham, would be £1,830,000. The running expenditure, including 6 crews, fuel, hydrogen, base charges, offices, depreciation, insurance fund, etc., would be £880,750. The receipts would be £1,827,480, divided between passengers (1,196,000), mails (£515,000), and goods (£116,480).

That is to say, there is a margin of about £1,000,000, and if the receipts were only one-half of those estimated there would still be a profit. There was, therefore, some justification for believing that an airship service can be made to pay. If that be so, it means that as soon as the initial difficulties have been overcome, a company should not only be self-supporting but, moreover, should be capable of paying good dividends.

The Financial Problem.—With most new developments it is possible to try them on a small scale. With the commercial airship operating over great distances this is not possible, as first, bases have to be provided, and, second, the ships themselves are large and costly vehicles. No development service of much value could be started under £4,000,000 of capital. Obviously no responsible person would take the doubtful step of raising money for an Imperial Service on the promise of large dividends, as there is not sufficient experience on which to obtain accurate figures.

Under these circumstances some interest other than the shareholder must be found to take the risk, and in order to meet this case a scheme was submitted to the Admiralty last August, and it is now under consideration.

The outline of this scheme was that a commercial company should be formed to take over from H.M. Government all existing airships and their bases, and to build a fleet of the latest type of vessels. The company would construct fuelling depots and mooring bases at Port Said, Bombay, Rangoon, Singapore, and Perth (Australia); and would institute, as soon as possible, a bi-weekly mail and passenger service to India with a weekly extension to Australia. The whole of the organisation would be at the disposal of the Admiralty in time of war and the vessels would be provided with protective inert gas containers to render them safe from the incendiary bullet. The Government, in consideration of the benefits previously outlined, were asked to guarantee the debentures as to principal and interest, and the ordinary shares as to dividends only for 10 years at the rate of 6 per cent. Under this scheme the Admiralty would take the risk and obtain for a possible liability, not an actual one, all the benefits that would be obtained by providing all the money required. The advantage to the Admiralty is self-evident, once it is admitted that the naval policy requires airships. Once that question is decided in the affirmative, only two courses are open: (1) to provide the whole of the money, or (2) to take the risk (in the form of a guarantee) and provide only a small portion.

I would rather lay the claim to Governmental assistance on the Imperial aspect, but I am prevented from so doing by Mr. Lloyd George's statement in the House of Commons in July last, that "No money is to be expended by way of subsidy on a Commercial Airship Service or upon Imperial communications."

The only way of obtaining the necessary Governmental backing is to make out the case for the uses of airships in naval warfare.

Considering the new type of airship when used entirely for reconnaissance purposes, the whole of the carrying capacity can be put into extra fuel and wireless equipment, resulting in an increase of range to 12,000 miles at 80 m.p.h., or 24,000 miles at 40 m.p.h., enabling the vessel to remain in the air for nearly three weeks without refuelling.

In considering an airfleet organised as a fighting unit it is difficult to separate the functions of the two classes of air machines, as each is the complement of the other. The aeroplane may be termed the gun or torpedo tube of the airship, and the greatest air-striking power is undoubtedly the largest airship carrying aeroplanes; the planes themselves carrying torpedoes, bombs or poison gas.

The aeroplane, although not protected with armour, can attack with a good prospect of success, by virtue of its very high speed and three dimensional movement, but it suffers from the defect of its limited radius of action.

The airship remedies this defect by giving to the aeroplane a speed and range of action in excess of any floating vessel. The airship, on the other hand, presents a target larger than a battleship and is, therefore, an unsuitable vessel to attack by itself. The aeroplane removes this defect by increasing the gun range of the airship by the radius of action of the aeroplane it carries.

Referring to the Battleship controversy Comdr. Burney pointed out that, whilst the two new battleships now being built are to be protected from torpedoes by extra bulkheads, saddle tanks, internal armour and other improvements of a technical character, and it is suggested that they will be enabled thereby to withstand the attack of four or five torpedoes before destruction occurs, was it not possible that the answer will be to construct torpedoes of five times the destructive power of those now made?

Bearing this situation in mind, it seems essential to analyse the basic conditions of sea power, if the real effect of air power on sea communications is to be evaluated.

Comdr. Burney then outlined the main functions a navy has to perform, showing that whilst he did not suggest, as did one school of thought in the Battleship v. Aircraft controversy that we should concentrate entirely upon aircraft, it did not follow that the opposite school—sea trade, etc., must be defended by sea-power—was the correct solution. He did contend, however, that aircraft would have a very considerable influence on naval development. He supported this argument by giving some figures as to the comparative reliability and costs of airships.

The air-keeping qualities of an airship depend mainly upon speed, and if her speed is high enough she will be enabled not only to maintain any assigned position, but also to make progress in the face of a heavy gale. Statistics show that the modern Zeppelin has flown comfortably in an 80 m.p.h. gale, and as the average gale does not exceed about 50 m.p.h., it necessarily follows that the modern airship once it is in the

air, has as good air-keeping qualities as the battleship has sea-keeping qualities.

As regards cost, assuming a battleship to cost as little as £4,000,000 and an airship as much as £250,000 it follows that 16 airships can be produced as cheaply as one battleship. It is estimated that 16 airships would carry between them as many as 32 torpedo carrying planes and 48 fighting planes. I think it will be readily conceded that if such a force of aircraft was to attack one battleship, it is more than probable that the battleship would succumb. The essential condition is that the planes must be brought to the point of attack.

In considering reconnaissance duties we have the fact that during the war one of the "R" class airships maintained wireless touch with the Azores from the North Sea. How then does such a vessel compare for these duties with a light cruiser?

An airship detailed for reconnaissance duties only can carry extra fuel in the place of fighting equipment; and when so equipped, would have a range of action of 20,000 miles. It would, of course, be necessary for her to carry a couple of fighting planes to defend herself from planes sent up from a single vessel. A rough estimate, neglecting repairs, interest on capital, depreciation, etc., of the comparative cost of an airship and a light cruiser in searching 1,000 square miles of sea shows that the cost by airship is £1 5s. per square mile and by light cruiser £77. As regards capital cost the same work would be done by a fleet of nine airships as by a fleet of 60 cruisers. The saving in capital cost being £51,750,000.

Since armaments must be reduced to a monetary basis, as money is the life-blood of the fighting services, it is evident that no navy can afford to neglect a cheap scouting force which may develop into a powerful fighting unit.

Comdr. Burney concluded his paper with some remarks on the development of the Royal Navy, showing how the lessons of history pointed to the necessity of developing on a commercial basis.

Mr. Holt Thomas's Resolution

On the last day of the Air Conference Mr. G. Holt Thomas proposed the following resolution: "In view of the necessity to increase rapidity of communication within the Empire, and in view of the progress made by other nations in civil aviation, the Conference calls on the Government to give due and immediate consideration to the foundation of an air mail throughout the Empire." The motion was seconded by Admiral Mark Kerr, and was carried unanimously.

LONDON TERMINAL AERODROME

Monday evening, February 12.

The aerodrome has been a scene of activity each night during the week, and if nothing else has been done, the bill for lighting has certainly assumed larger proportions.

The weather during the week has again been unkind to aviation, and, apart from the effect on the services, the continual rain is again flooding the country, giving passengers on machines which get through a new aerial view-point of the countryside. Mr. Rogers, who piloted one of the Handley Page machines from Le Bourget to Croydon during the week-end, reports that Tonbridge has become an "island," being entirely surrounded by flood-water.

The weather fortunately cleared for Friday, when the Harlequin Rugby XV were booked to fly to Cologne by the Instone Air Line in order to play a match with a team from the Army of Occupation on Saturday. With the ordinary passengers, this meant sending no fewer than three machines to Cologne, and as the Instone fleet has been depleted by an accident to one of their machines at St Inglevert earlier in the week, one of the Daimler machines was diverted from the Manchester-London-Amsterdam route, and sent to Cologne.

After beating the Army of Occupation by something like 52 points to 3, the Harlequins flew back on Sunday in the same their machines. One of the Instone D.H.34's has now been fitted with larger petrol tanks, and was able to make the non-stop flight to and from Cologne, thereby saving about half-an-hour on the journey.

On Friday, the Daimler Airway had all their machines in the air together. One was flying from Manchester to London, one from London to Amsterdam, another from Amsterdam to London, and the other from London to Cologne. Incidentally all their pilots were also engaged.

I understand that the Fokker V, the new eight-seater Rolls-Royce engined monoplane which Mr. Fokker has built for service with the Royal Dutch Air Service, is now completed, and has undergone its tests successfully, and will shortly be put on the Amsterdam-London service. Its first flight to Croydon is eagerly awaited at the air-station.

A Smart Piece of Engine Work.

A REMARKABLY quick feat of engine-changing was performed by the Daimler staff, when one of their machines was forced to alight with engine trouble near Rugby. It is, of course, an unusual event for this company to have engine trouble, but there are exceptions to every rule. When the news of the forced-landing came through and it was realised that a new engine would be needed, one was immediately loaded onto a lorry and set out—with a staff of mechanics and a good stout pole—for the scene of the forced-landing. Within 36 hours of the machine having descended it was in the air again with a new engine, which had been installed in the field. When it is realised that the engine weighs something like half-a-ton, this would appear no mean feat.

Despite the rain and storms of the week-end, quite a number of sightseers turned up at the aerodrome and the Surrey Flying Services were able to collect several joy-riders—quite enough, in fact, to make it worth their while bringing round one of their Avros.

A military "Goliath" visited the air-station during the week, and its occupants, with their French uniforms, have given quite a splash of colour to the Trust House while they have been waiting for the weather to become good enough for Service aviation. Needless to say, there were several days before this occurred when the weather was considered O.K. for civil aviation.

THE ROYAL AIR FORCE

London Gazette, February 6, 1923.

General Duties Branch

The follg. Pilot Officers to be Flying Officers:—P. W. Adams, E. B. Addison, E. J. Dashwood, A. M. Glover, A. L. Harris, G. P. F. Hills, E. C. N. Jeffries, R. P. Mollard, G. C. Sclater, F. K. Wright; Dec. 28, 1922. S. H. Cooper, B. J. O'C. Hanstock, R. C. Wansborough; Jan. 4. R. H. Mahon, T. J. Shaw; Jan. 5. F. G. Whitmore; Jan. 8.

Flying Officer A. W. Saunders, D.F.C., is transferred to Reserve, Class A; Feb. 5. Squadron Leader (actg. Group Capt.) F. H. Moody, M.C. (Maj.,

Indian Army), relinquishes his temporary commn. on return to Army duty; Jan. 15. Squadron Leader S. C. W. Smith, D.S.O., is placed on retired list on account of ill-health contracted in the Service; Feb. 7. Flying Officer M. J. Langley, D.F.C., is removed from the R.A.F., His Majesty having no further occasion for his services as an officer; Jan. 23.

Medical Branch

H. E. H. Tracy is granted a temporary commn. as a Flight Lieut., with effect from, and with seniority of, Jan. 23.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the R.A.F. are notified:—*Air Commodore*: L. E. O. Charlton, C.B., C.M.G., D.S.O., from R.A.F. Depot (Inland Area) to Headquarters, Iraq Command. 2.2.23.

Squadron Leaders: E. H. Johnston, O.B.E., from No. 24 Squadron (Inland Area) to command No. 30 Squadron (Iraq Command). 13.12.22. Substituted for the notification concerning this officer which appeared in R.A.F. Bulletin No. 94 dated 20.12.22. A. T. Harris, A.F.C., from Headquarters, Iraq Command, to command No. 45 Squadron (Iraq Command). 20.11.22. A. A. B. Thomson, M.C., A.F.C., from No. 39 Squadron (Inland Area) to Armament and Gunnery School (Inland Area). 26.2.23.

Flight Lieutenants: T. Henderson, M.C., A.F.C., from No. 100 Squadron (Inland Area) to No. 1 School of Technical Training (Boys) (Halton). 2.2.23. V. R. Smith, from Central Medical Board (Coastal Area) to Headquarters, R.A.F. Middle East (Supernumerary). 24.1.23. H. E. H. Tracy, to Research Laboratory and Medical Officers' School of Instruction (Coastal Area). On appointment to Temporary Commission in Medical Branch. For short-course of instruction. 23.1.23. G. C. Anne, O.B.E., from Inland Area

Aircraft Depot to Air Ministry (Dept. of A.M.P.) (D.D.P.). 9.1.23. Substituted for the notification concerning this officer which appeared in R.A.F. Bulletin No. 102 dated 26.1.23. C. P. O. Bartlett, D.S.C., from R.A.F. Depot (Inland Area) to School of Naval Co-operation and Aerial Navigation. (Coastal Area). For duty as Adjutant. 1.2.23. C. K. Chandler, M.B.E., from No. 267 Squadron (Mediterranean Group) to Headquarters, R.A.F. Middle East. 27.1.23. R. A. Young, from Air Ministry (Dept. of A.M.P.) (D.D.P.) to R.A.F. Depot (Inland Area). (Supernumerary). 9.1.23. E. F. N. Currey, from R.A.F. Depot (Inland Area) to Central Medical Board (Coastal Area). 5.2.23. P. Huskinson, M.C., from R.A.F. Cadet College (Flying Wing) (Cranwell) to Armament and Gunnery School (Inland Area). 26.2.23. E. J. Cooper, D.S.C., from Marine and Armament Experimental Establishment (Coastal Area) to Armament and Gunnery School (Inland Area). 26.2.23. B. J. W. Brady, D.S.M., from No. 1 School of Technical Training, (Boys) (Halton) to Armament and Gunnery School (Inland Area). 26.2.23. A. W. Fletcher, D.F.C., A.F.C., from H.M.S. "Argus" (Coastal Area) to R.A.F. Base, Leuchars (No. 203 Squadron) (Coastal Area). 27.1.23.

RESERVE OF AIR

THE Air Ministry announces that the recent decision to proceed with the expansion of the R.A.F. by the formation of a force for Home Defence entails an increase in the size of the Reserve.

The formation of a Reserve of officers was provided for by the Short-Service Commission scheme announced in 1919, which is now beginning to supply an automatic flow of officers to the Reserve after a period on the active list.

In addition provision has now been made for the expansion of the Reserve by the entry as officers of a number of ex-officers of the Flying Services and others with special qualifications for flying and technical duties.

Provisional regulations for the Reserve of Air Force Officers are in course of preparation and will shortly be available for issue.

Meanwhile, the Air Ministry is prepared to receive and consider applications for enrolment in the Reserve from the following classes:—

(a) Officers who served as pilots in the R.F.C. or R.N.A.S. and who were demobilised before they had completed their Reserve service.

FORCE OFFICERS

(b) Other officers who served as pilots in the R.F.C., R.N.A.S. and/or the R.A.F. during the Great War.

(c) Gentlemen qualified as civilian pilots who have not previously held any commission in the R.F.C., R.N.A.S. or R.A.F.

(d) Officers who served in a technical branch of the R.F.C., R.N.A.S. and/or the R.A.F. during the Great War.

(e) Gentlemen who possess the necessary technical qualifications in connection with aircraft in the following branches:—

- (i) Engines and rigging.
- (ii) Wireless telegraphy and signals.
- (iii) Photography.
- (iv) Armament.
- (v) Airships and balloons.
- (vi) Stores.

Full details and forms of application may be obtained by writing to the Secretary, Air Ministry, Kingsway, W.C. 2. Personal applications should not be made.

INTERNATIONAL AIR CONGRESS (LONDON), 1923

A PORTION of the expenses in connection with the International Air Congress which is to take place in London from June 25 to 30 this summer will be covered by a special grant from the Air Ministry, and in addition to this there will be certain receipts from membership subscriptions, etc. The Committee, however, felt it desirable to form a guarantee fund of not less than £2,000, which, together with the Air Ministry's grant, will, it is anticipated, provide security for the expenditure. This fund was opened by the Duke of Sutherland (Chairman of the Main Committee) with a promise of £100, and the list of promises received is as follows:—

Shell-Mex, Ltd., £500; The British Petroleum Co., £250; Messrs. Vickers, Ltd., £250.

£100 each: Lord Cowdray, Lord Inverforth, Lord Invernairn, the Duke of Sutherland, Lord Weir, Messrs. Armstrong-Siddeley Motors, Ltd., the Bristol Aeroplane Co., the Fairey Aviation Co., the H. G. Hawker Engineering

Co., Messrs. Rolls-Royce, Ltd., the Westland Aircraft Works, Messrs. A. V. Roe and Co., Ltd., and Mr. Holt Thomas.

Messrs. George Parnall and Co., £75.

£50 each: Lord Burnham (proprietors of the *Daily Telegraph*), Sir John Ellerman, Lord Londonderry, Sir Edward Manville, Lord Waring, the Aircraft Disposal Co., the Effingham Steel Works and Rolling Mills Co., Ltd., Messrs. Thomas Firth and Sons, Ltd., the Gloucestershire Aircraft Co., Messrs. Handley Page, Ltd., the Palmer Tyre, Ltd., and the De Havilland Aircraft Co., Ltd.

Commander Burney, £26 5s.

£25 each: Sir James Dunn, Mr. Philip Foster, Maj.-Gen. J. E. B. Seely, and the Blackburn Aeroplane and Motor Co., Ltd.

The Institute of Transport, £21; Messrs. Accles and Pollock, £20; Sir Mortimer Singer, £10; Mr. F. G. Luke, £3. Total, £3,155 5s.

Transfer of Anti-Aircraft Units

INSTRUCTIONS have been issued by the Army Council to the effect that, in future, all artillery anti-aircraft units of the Regular and Territorial Armies are to form part of the Royal Garrison Artillery. R.F.A. officers of the Regular Army now serving in anti-aircraft units, if they so desire, will continue in their present employment until they are required for posting elsewhere in accordance with the normal exigencies of the service. All R.F.A. other ranks at present serving in the 1st Anti-Aircraft Brigade, R.F.A., will be permitted, if they so desire, to transfer to the R.G.A.;

while R.F.A. personnel not desirous of transfer to the R.G.A. will remain attached to their present unit until they can be absorbed in the R.F.A. establishment. Officers of the Territorial Army who have been appointed to the anti-aircraft brigades will now be transferred to the anti-aircraft brigades, R.G.A., T.A.; other ranks now serving in Territorial anti-aircraft units, who are desirous of continuing in the converted units, will be dealt with as transfers; while warrant officers, non-commissioned officers, and men not electing to serve with the converted units will be given the option of (a) transferring to another unit (b) being discharged.

PERSONALS

Married

WALTER SOMERVILL SCOTT (late Major R.A.F.) was married on February 10, at Emmanuel Church, Southport, to HELEN EDITH, the eldest daughter of Mr. and Mrs. A. B. BROWN, of 19, Leyland Road, Southport.

To be Married

The engagement is announced between PETER HOWARTH, A.R.C.A., D.F.C., son of Mr. Peter Howarth and Mrs. Howarth, of Accrington, and ZEMA, daughter of Mr. W. H. COGILL and Mrs. COGILL, Arcadia, Pretoria, South Africa.

The engagement is announced between Mr. H. HAMSHAW THOMAS, M.B.E., M.A. (Capt., late R.A.F.), Dean and Steward of Downing College, Cambridge, and Miss E. GERTRUDE TORRANCE, M.A., daughter of Mr. and Mrs. JOHN TORRANCE, of Cape Town, South Africa.



Casale Goes Upstairs

On February 11 Jean Casale, on a Spad-Herbemont, fitted with a Bristol "Jupiter" engine, succeeded in reaching an altitude of 7,200 metres (23,600 ft.). This is claimed as a world's record on account of the fact that the machine, in addition to the pilot, carried a load of 550 lbs. It is probable that the corrected figure will be somewhat lower than that indicated. The previous record for machine with this load was established by Adjutant le Boucher.

Cancelled Lectures at the I.Ae.E.

We learn from the Secretary of the Institution of Aeronautical Engineers that, owing to unforeseen circumstances, the meeting which had been arranged for February 9 had to be cancelled, and also the paper to have been read by Dr. Thurston on February 23.

Fatality on Cairo-Baghdad Air Route

AN accident occurred to the Baghdad Air Mail last week, resulting in the death of the pilot, Flying Officer H. J. Bradley. The machine, a Vickers-Vimy, overturned in the course of a forced landing 100 miles east of Amman, and the pilot was suffocated before he could be released; the passengers were unhurt.

The North-East Coast Aero Club

We are informed that the above Club was formed on December 7 last, with the intention of bringing together enthusiasts in the North, and of thereby furthering interest and study in aeronautics. A syllabus of lectures and papers has been arranged, and model work is already begun. Any of our readers interested should communicate with the Hon. Sec., Crown Hotel, Newcastle-on-Tyne.

A Visit to "Avro's" at Manchester

In the course of last week, at the invitation of Sir William Letts, some prominent members of the Press took the opportunity of paying visits to the factories of Crossley Motors, Ltd., Willys-Overland-Crossley, Ltd., and A. V. Roe and Co., Ltd. (Newton Heath). As no doubt most of our readers are aware, the large factory of A. V. Roe and Co., Ltd., in which Crossley Motors, Ltd., have a controlling interest, is not only occupied on the production of aircraft, but also builds motor-car bodies for Crossley cars. We need hardly dwell upon the recent activities of the aviation section of A. V. Roe and Co., as we have recorded same from time to time in previous issues of FLIGHT—particularly in our Special Paris Show number for December 14 last. Suffice it to say that the following three machines figure prominently on the 1923 programme:—Avro "Aldershot-Condor" long-distance bomber (650 h.p. Rolls-Royce "Condor"), Avro "Bison" Fleet Gunnery Spotter (450 h.p. Napier "Lion"), and the Avro-Napier long-distance bomber, fitted with a 1,000 h.p. Napier "Cub," the most powerful single-engined aeroplane in the world.

A Record Trip by Flying Boat

ONE of the Aeromarine 11-passenger flying boats, the "Governor Cordeaux," with 12 passengers and a crew of two aboard, flew recently from Miami, Fla., to Nassau in the Bahama Islands, a distance of 187 miles, in 1 hr. 51 mins. This is claimed to be the fastest time ever made between these two points. The steamer time between Miami and Nassau is 18 hrs. and the ordinary flying time is 2½ hrs.

Air Mail Stamps and Correspondence

THE Editor of FLIGHT invites correspondents throughout the world to send him letters (addressed to 36, Great Queen Street, Kingsway, London) by their national or local air mails. These will have special and personal acknowledgment in the Editorial columns of FLIGHT, and help to encourage the more general use of the air for mail carrying. The Editor would also greatly appreciate any items of interest or news relating to air mail services and air stamps.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda:—No. 792. The Reduction of the Effective Value of Young's Modulus in Flexible Compression Members. By A. J. Sutton Pippard, M.B.E. April, 1922. Price 3d. net.

No. 798 (E. 3). Air Consumption and B.H.P. of Aero Engines. By H. Moss, M.Sc. March, 1922. Price 1s. 3d. By post 1s. 4d.

No. 804 (Ae. 57). Tandem Aerofoils. By J. L. Nayler and W. L. Le Page. March, 1922. Price 6d. net. London: H.M. Stationery Office, Kingsway, W.C. 2.

Aeronautical Research Committee Reports and Memoranda, No. 807 (E. 5). R.A.E. Electrical Indicator for High-Speed Internal Combustion Engines. By H. Wood. April, 1922. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 9d.; by post 10d.

Department of Overseas Trade. Report on the Economic Situation of the Republic of Ecuador, September, 1922. By W. C. Graham. London: H.M. Stationery Office, Kingsway, W.C. 2. Price 9d. net.

Department of Overseas Trade. Report on the Trade and Commerce of East Africa, revised to September, 1922. Compiled by C. Kemp. London: H.M. Stationery Office, Kingsway, W.C. Price 1s. 6d. net. By post 1s. 7½d.



AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: cyl. = cylinder; I.C. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1921

Published February 8, 1923

- 21,343. LUFTSCHIFFBAU ZEPPELIN GES., L. DURR and P. JARAY. Device for taking in ballast for airships. (191,419.)
21,472. J. C. SAVAGE. Smoke, etc., trails from aircraft. (191,420.)
23,751. A. B. DE FIN and J. N. M. WALKER. Rotary engines. (191,424.)
26,490. LUFTSCHIFFBAU ZEPPELIN GES. and J. JARAY. Aircraft sheds. (182,420.)
26,652. L. E. FORD. Spherical airship. (191,445.)
30,453. V. SEVIAN. Aeroplanes. (191,542.)
34,383. F. H. ALEXANDER and J. W. GILLIE. Clinometers. (191,591.)

Published February 15, 1923

- 6,867. G. BENNIE. Aerial tracks for guiding aircraft. (191,760.)
28,806. E. S. G. REES. Propulsion and manoeuvring of aircraft, etc. (191,868.)

APPLIED FOR IN 1922

Published February 8, 1923

- 1,056. S. E. SAUNDERS. Hulls for flying boats, etc. (191,612.)
14,572. E. L. WALKER and V. L. VERBECK. Screw propellers with flexible blades. (191,669.)
16,350. C. J. STEWART, W. W. STAINER, and L. BURN. Turning-indicators. (191,676.)

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